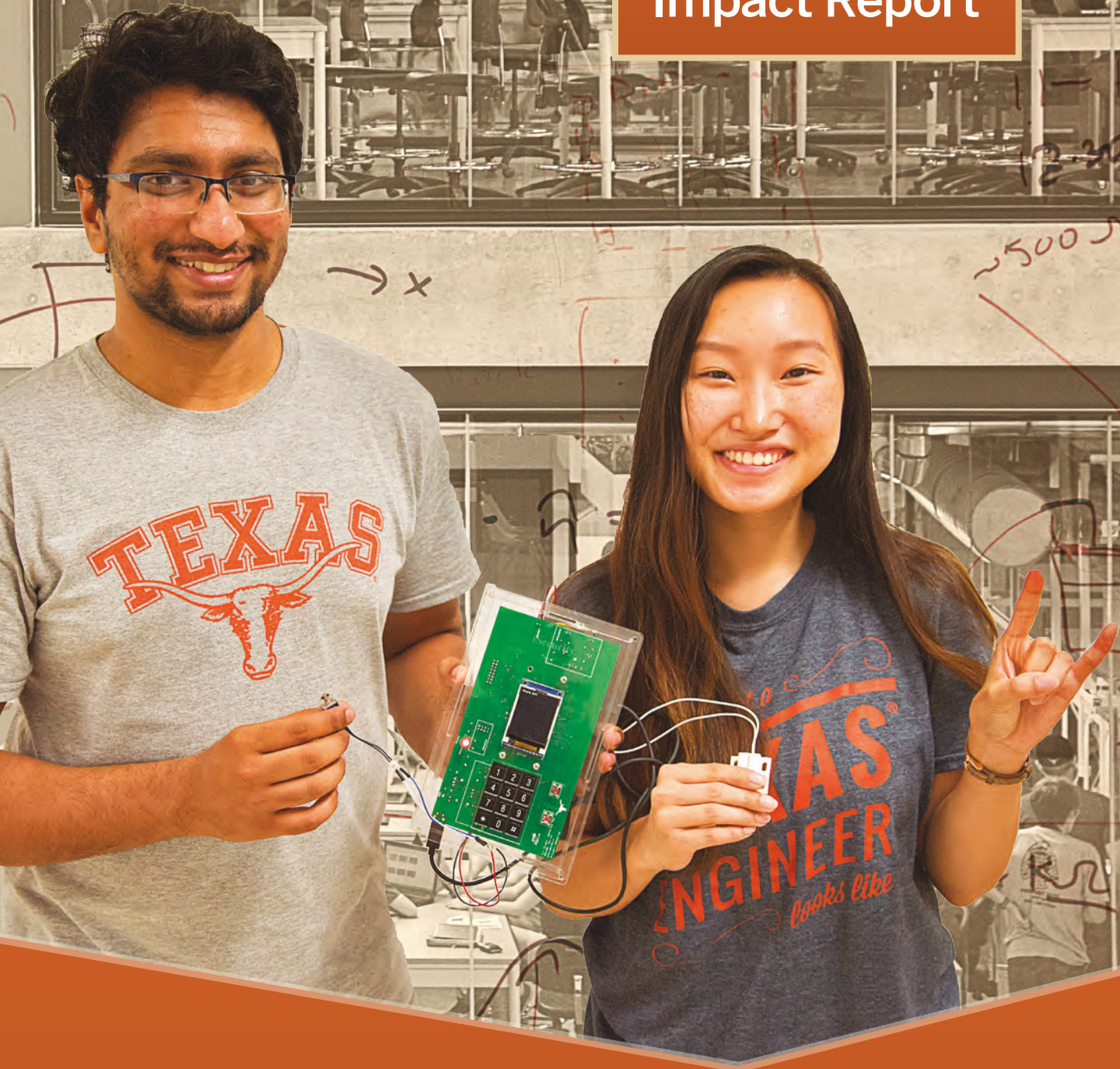


TEXAS ECE Impact Report



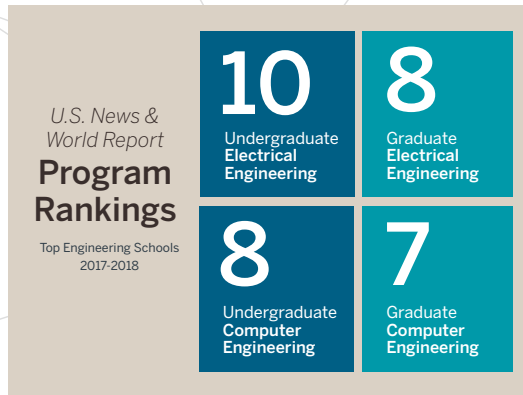
The University of Texas at Austin
Electrical and Computer
Engineering
Cockrell School of Engineering

LEADERSHIP

DR. AHMED TEWFIK



Dr. Ahmed Tewfik, Chair, Texas ECE



Greetings from our new home in the new Engineering Education and Research Center (EER)! The EER building is magnificent and is finally providing us with the right infrastructure to deploy our ambitious vision for the department.

Distance collaboration and telepresence technologies pervade our classrooms and meeting spaces. Small and large conference rooms are spread across the building, encouraging spontaneous and planned interactions between researchers and students. A very large maker-space, with over 20,000 sq. ft. of space, is a strong provocation to invent and inquire. It is also rapidly becoming a new mindset for our students and faculty and not just a physical facility. The state-of-the-art auditorium, complemented by breakout rooms and a welcoming reception space, provides an ideal setting for holding events that bring academia, industry, government and the venture community together, such as the inaugural Disruptive Technologies Conference held in early September.

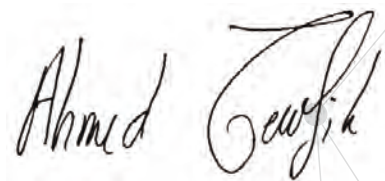
Our most valuable resource is unquestionably our human capital: the faculty, students, staff, and visitors who form the creative and dynamic Texas ECE community.

The selectivity of our program keeps increasing, with undergraduate and graduate admissions rates of 23.8% and 15.4%. The quality of our faculty is reflected in their prestigious awards and recognitions, their visibility in professional venues and in the media, the steady rise in our externally funded research, and our winning of a National Science Foundation (NSF) Materials Research Science and Engineering Center (MRSEC) this past year.

With such phenomenal human capital and superb facilities, we are implementing our vision to become a teaching, research and disruptive innovations department.

Our students, alumni and research help drive new markets and the creation of product categories. Our bold and ambitious curriculum reform focuses on learning through invention, offering deep year-long design experiences for the first time to our freshman, changing the way that critical electrical and computer engineering concepts are packaged into courses and delivered, providing our students with a strong liberal arts education and an unprecedented amount of flexibility in their curriculum, and most importantly using experiential learning to teach them the myriad of soft skills they need to master to become true disruptive innovators. We are also working to identify potentially disruptive research problems in collaboration with industry and the venture capital and entrepreneurial ecosystems.

This is truly an exciting time to be an electrical and computer engineer and in particular, one at Texas ECE! Our past and future accomplishments are only possible, and can only be sustained, by the generous time and financial support of all of you, our friends, partners and alumni!



Engineering Education and Research Center

The Engineering Education and Research Center (EER) is the university's new hub for engineering education, research and innovation, and serves as a center for multidisciplinary collaboration and the new home for the Texas ECE.



"From floor to ceiling, the EER is designed to do more than simply facilitate classes, research and meetings. We envisioned a facility that would inspire creativity and motivate students to think bigger."

- Dean Sharon Wood

430,000 sq. ft.
for labs, classrooms and collaboration



23,000 sq. ft.
of design lab and maker space

The two-story, 23,000 sq. ft. **National Instruments Student Project Center** Gives students the opportunity to engage in the practice of engineering and inhabit the identity of being an engineer. They can explore outside the confines of their own discipline and build an education for themselves.



Innovation Center
connecting research to the outside world

The Innovation Center, headed by Texas ECE professor and Ethernet co-inventor **Bob Metcalfe**, is an open, collaborative environment dedicated to entrepreneurship training and commercialization programming, and shows students how research connects to the outside world.

STUDENTS

MEASURING IMPACT

2,196 Total Texas ECE Students



Undergraduate Program

1,580 Total Undergraduate Students

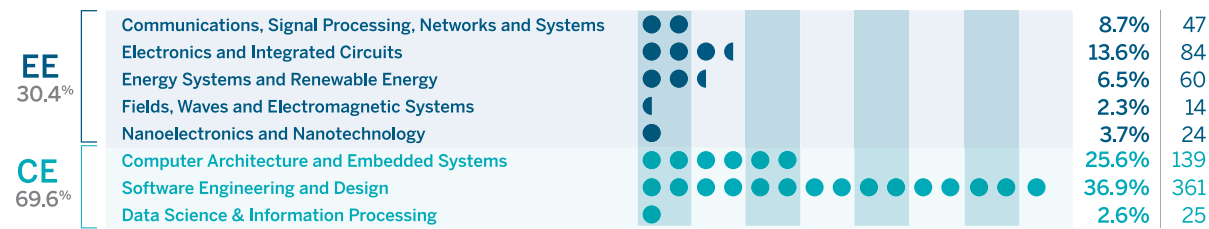
18% Female
14% Underrepresented Minorities

Admissions



Undergraduate Students by Technical Core*

*Represents completed tech core elections (sophomore/juniors)



Data Science & Information Processing Technical Core added in Fall 2016.

Graduate Program

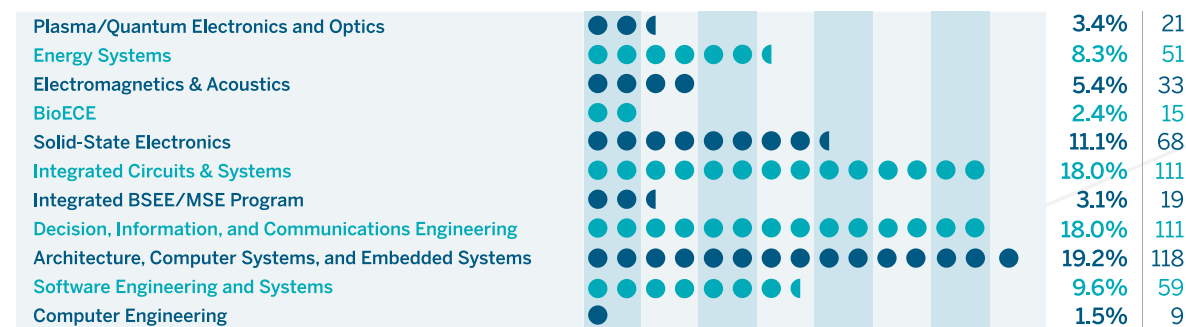
386 Total PhD Students
230 Total MS Students

18% Female
3% Underrepresented Minorities

Admissions



Graduate Students by Primary Research Area



FACULTY

MEASURING IMPACT

61 Tenured and Tenure-Track Faculty

Texas ECE will be adding 11 new tenured and tenure-track faculty in the next two academic years.

Current faculty includes:

3 ACM FELLOWS
2 NAE MEMBERS
29 IEEE FELLOWS

All-Solid-State Battery Cells



95-year-old professor John Goodenough and team have developed the first all-solid-state battery cells that could lead to safer, faster-charging, longer-lasting rechargeable batteries for handheld mobile devices, electric cars and stationary energy storage.

Moore Inventor Fellowship



Prof. Deji Akinwande was awarded the inaugural Moore Inventor Fellowship for creating an atomically thin 2D-silicon structure known as silicene, which could provide a tenfold increase in energy efficiency for integrated circuits such as computer chips.

New Faculty



Alex Q. Huang

Dula D. Cockrell Centennial Chair in Engineering

Dr. Huang is a world renowned expert of power semiconductor devices, power electronics, smart grid and renewable energy system. He has published more than 500 papers in journals and conferences, and is the inventor of more than 20 US patents including several patents on the Emitter turn-off (ETO) thyristor technology that received a prestigious R&D 100 award in 2003. Dr. Huang is also widely credited for his contribution in developing the Energy Internet concept and the Solid State Transformer (SST) based Energy Router technology. His work on the SST has been named by MIT Technology Review as one of the world's 10 most important emerging technologies in 2011.



Mark J.T. Smith

Dr. Smith serves as the Dean of the Graduate School and Senior Vice Provost for Academic Affairs. Beyond his leadership, Smith is widely recognized for his academic contributions and research in speech and image processing as well as object detection and recognition. He was also a member of the U.S. Olympic fencing teams in 1980 and 1984.



Jean Anne Incorvia

Dr. Incorvia is focused on developing practical nano devices for the future of computing using emerging physics and materials, including research in fabricating spintronic logic devices and circuits, new types of magnetic memory using spin orbit torque effects, the intersection of 2D materials and spintronics, and using low-dimensional materials for interconnects and transistors.



Jaydeep Kulkarni

Dr. Kulkarni's research is focused on integrated circuits and systems including energy efficient logic and memory circuits, power management, and hardware security. This research also extends to the applications of emerging nanotechnologies and novel computer architectures for data centric designs.



Hao Zhu

Dr. Zhu's research focuses on electric power grids and in general signal processing over networked systems. Her current research interests include energy data analytics, cyber-physical grid monitoring, distribution grid design and inference, and coupled infrastructure networks.

RESEARCH

MEASURING IMPACT

Research Expenditures (2016-2017)

\$20,795,132

▲ 8% in past 5 years

Netflix's Video Quality System Relies on Neuroscience-based Visual Information Fidelity (VIF) Model



Dr. Al Bovik (Texas ECE Professor)

Emmy Award-winning **Professor Al Bovik's** Television picture quality measurement tools continue to be used on a grand and growing scale. Recently, **his neuroscience-based Visual Information Fidelity (VIF) model has been built as the core engine of Netflix's video quality system that controls the picture quality of every video streamed by Netflix to all customers worldwide.** Prof. Bovik's video quality measurement models, which have injected the principles of visual neuroscience deep into global communication networks, affect the viewing experiences of hundreds of millions of broadcast, satellite, cable, and internet television viewers each day.

Researchers Receive \$15.6 million NSF Materials Research Science and Engineering Center (MRSEC) Grant to Discover and Advance New Types of Materials



(L-R): Dr. Edward Yu (Texas ECE professor, Director, CDCM), Cassandra Huff (Texas ECE undergraduate), Zhongjian Zhang (Texas ECE PhD student)

Texas ECE professor **Edward Yu** will serve as director of a new center to discover and advance new types of materials for use in many applications including energy storage, medical devices and information processing. The UT Austin Center for Dynamics and Control of Materials (CDCM) will include 23 faculty members from the university's Cockrell School and College of Natural Sciences and one researcher from Rice University.

Researchers at the center are particularly interested in developing materials that have the ability to form, reform and reconfigure with different properties as they are being used. These new capabilities could pave the way for new technologies in medicine, electronics and other areas.

Lightweight, Inexpensive Distributed Technology Incorporated into Child Independent Mobility

Prof. Christine Julien and **Prof. Mohit Tiwari** are investigating the use of lightweight, inexpensive distributed technology to foster community supported Child Independent Mobility (CIM). **The project envisions small "tags" carried or worn by children that are detectable by trusted community devices that are carried by adults or embedded in the community.** The project will make it possible for parents to define rules that capture conditions in which their child is considered safe or unsafe, reliably triggering notifications or community response to anomalous events.



Dr. Ahmed Tewfik, Chair, Texas ECE

Texas ECE Hosts Disruptive Technologies Conference

Texas ECE hosted a conference on disruptive technologies on September 7, 2017 which brought together industry executives, academics, and venture capitalists to discuss cutting-edge research and the challenges of collaborating between the three sectors.

The conference featured four panel discussions on topics including **Autonomous Vehicles and Safety Critical Systems**, **Applied Machine Learning**, **The Future of Education**, and **The Future of Infotainment**.

The **Autonomous Vehicles and Safety Critical Systems** panel focused on the challenges of deploying millions of autonomous vehicles that consistently operate safely and reliably.

The **Applied Machine Learning** panel addressed questions such as the role of man-machine symbiosis or man-machine learning collaboration in the future and the infrastructure/hardware/networking needs to deploy machine learning.

The Future of Education panel debated what defines electrical engineering, computer engineering and

computer science education in the 21st century, and how we prepare our students for the jobs they will hold in 30 years.

The panel on **The Future of Infotainment** explored the future of augmented reality, virtual reality and their integration with brain-machine interfaces, and breakthroughs needed to deliver these systems in form factors that will be acceptable to the self-image conscious consumer.

The conference also presented discussions on the future problems and potential solutions of a variety of technologies including **Security and Privacy**, **Wireless Communications**, **Flexible Electronics**, **Robotics**, and **Data Centers**.



(L-R): Bob Metcalfe (Texas ECE professor), Eric Feng (KPCB, BS '99), Jason Stinson (Renovo)



(L-R): Jon Valvano (Texas ECE professor), Bob Mansfield (Apple, BS '82)

EDUCATION

MEASURING IMPACT

Bite-Sized Courses

Bites courses are envisioned as small courses focused on specific skill sets that our students need to be successful in internships, careers (and in their courses) that are not part of the core coursework. Some of our students have already acquired these skills by other means, so these bites offerings are meant to be supplementary and preparatory for a subset of the students. They are designed to be offered on a short course format, where one-credit worth of material is encapsulated more densely in one half of the semester. The first of these courses was designed and offered by one of our own graduate students under the supervision of a tenure-track faculty member, giving the graduate student a traineeship in teaching. In the future, we expect bites courses on a range of topics, taught by a vibrant mixture of regular faculty, visitors from industry, and supervised graduate students.

First-Year Design Experience

First-Year Design Experience (FDE) is a two semester "bite-sized" course where students form groups of five and use the conceptual topics they are being taught to design components, bigger components, and, finally, systems. **It is a combination of a top-down and bottom-up learning approach that introduces them to a hands-on design experience they will use throughout their academic careers.** For example, this year's first-year students will reinvent the iPhone, decomposing the iPhone down into component-size objects that need to be designed and fabricated.

Edison Lecture Series Encourages STEM Careers in Middle and High School Students

The Edison Lecture Series engages middle and high school students with the fun side of electrical and computer engineering. Edison attendees learn the fundamentals of an engineering topic through a university-style lecture, then see these concepts come to life through hands-on demos. Edison has reached over 28,000 Central Texas students since its inception in 2005. **The 2018 Edison Lecture Series will be held February 9, 2018 and will focus on Autonomous Vehicles, continuing the exploration of the topic from the Disruptive Technologies Conference.**

The Energy Case Competition

As freshmen, **Michael Liu and Marwan Madi** started **The Energy Case Competition** to spark teams of three to four undergraduate students of any major to collaborate and use their problem-solving skills and aptitude creatively to create and present an innovative and prospective solution plan that addresses the main challenges facing the United States energy sector. The students research current technologies to tackle today's largest issues of growing energy demand and climate change.

(L-R): Michael Liu (Petroleum Engineering junior), Marwan Madi (Texas ECE sophomore)



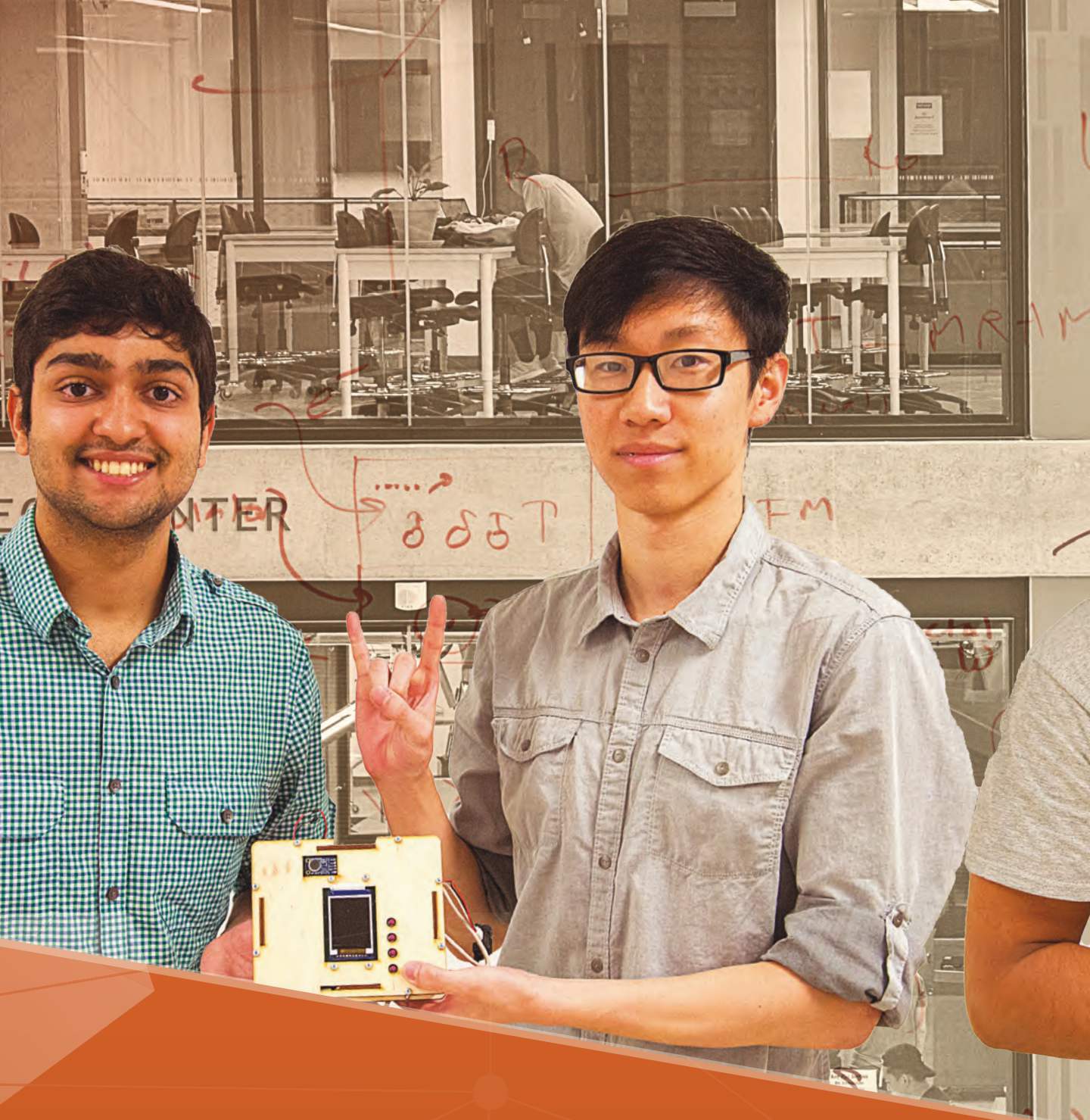
Award Winning Shopping App First To Recognize Buyers Emotions

Texas ECE alum **Sowmiya Chocka Narayanan's** fashion-tech startup **Lily** is the first fashion shopping search engine to recognize the vital role emotions play in a woman's buying decisions, particularly how she perceives a specific clothing item will suit her body. Chocka Narayanan and fellow Lily founder Purva Gupta spent two years building the app before going live, which included more than 10,000 hours of research interviews with women to help further develop Lily's proprietary algorithms.

Partnering with Industry

Work with a Texas ECE hands-on account manager to craft your campus strategy. Learn how companies have collaborated with us to advance their R&D, recruit top students, and contribute to important initiatives to encourage diversity in the tech talent pipeline.





Department of Electrical and Computer Engineering
The University of Texas at Austin
2501 Speedway, Austin, TX 78712

ece.utexas.edu

 **The University of Texas at Austin**
WHAT STARTS HERE CHANGES THE WORLD

Fall 2017

connect with us



[utexasECE](https://www.facebook.com/utexasECE)



[@utexasECE](https://twitter.com/utexasECE)